

OFFICIAL COPY.

Dr. F. St. George Mivart's Report to the Local Government Board on the Sanitary Circumstances of the Hayle and Phillack Urban Districts; and on Administration by the respective District Councils.

RICHD. THORNE THORNE,
Medical Officer,
July 12th, 1897.

I.—Hayle Urban District.

A.—SANITARY CIRCUMSTANCES.

General Description.—The Hayle Urban District is composed of two parishes, viz., St. Erth urban, and Phillack West, which are situated in different registration districts, viz., the former in that of Penzance, and the latter in that of Redruth. It has an area of 257 acres. The enumerated population of the district in 1881 was 1,089, and in 1891, 1,172 persons, of whom 478 resided in the St. Erth portion, and 694 in the Phillack portion. The number of inhabited houses was 219 in 1881, and 210 in 1891. At the present time the number is said to be 239. The district lies between Phillack urban district, on the east, and West Penwith rural district, on the west.

The town of Hayle is situated at the foot of a slope around the head of a creek opening into the estuary of the Hayle river in St. Ives Bay. The town, though small, was formerly one of the leading mercantile centres of Cornwall. It possesses extensive quays forming one of the most important harbours on the exposed north coast. The entrance through a somewhat narrow channel is only kept free from drift by impounding the water on the flowing tide in the large reservoir known as Hayle Pool, or the Canal, and sluicing it out again with great velocity at low water. The Hayle urban district stretches but little in a westerly or southerly direction beyond the town to which it owes its name, while to the north-east it does not extend further than the swing bridge at the harbour. The extension of the main street beyond this point, by the side of Hayle Pool, is within the Phillack Urban District, though still topographically forming part of the town of Hayle. The important feature of the town is the iron foundry and extensive engineering works of Messrs. Harvey, who at one time employed more than a thousand men, whose dwellings form a considerable portion of the extension of Hayle town, commonly known as Copperhouse, and situated in Phillack Urban District. The activity of these works is, however, now diminished. Other important local industries are the large milling and biscuit works of Messrs. Hosken, Trevithick, and Polkinghorne, as well as smelting works and breweries. The National Explosives Company, whose works are situated at some distance in the parish of Gwinnear, ship from Hayle in their own steam vessels. The workpeople employed in these various industries live for the

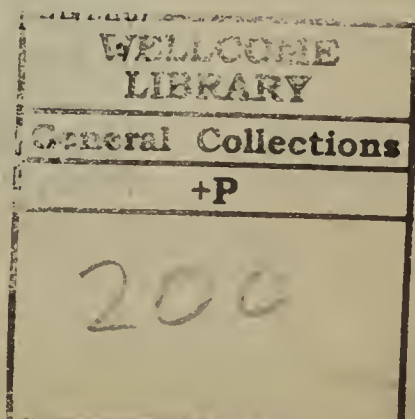
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most part in the Phillack Urban District, going to their daily work in the Urban District of Hayle, while others living at Hayle are employed in Phillack. The main sewer of the Phillack Urban District passes through the Hayle District to its outfall in the river, while the public water supply of the Hayle Urban District has its sources in the District of Phillack.

The inspector of nuisances for the District of Hayle is surveyor to the Phillack Urban District Council. So that, in every way, socially and commercially, the two districts are closely connected.

The surface soil consists of clay or loam resting upon clay slate, known as "killas." The heights above ordnance datum in Hayle District vary from about 120 ft. on the surface of the water in the reservoirs when full, to 16 ft. 8 ins. on the floor of the Hayle Council Chamber.

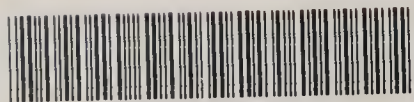
Dwelling Accommodation.—Out of the total 239 houses in the Urban District of Hayle, 188 are rated at less than 10l., and 90 at less than 5l. As a rule the houses are substantially built of stone or copper-slag refuse cemented over. Except in a very few instances where, in past years, back-to-back houses containing three or four rooms had been built, no notable overcrowding of dwellings upon area was observed. As a rule there is a fair amount of back space, and the greater number of houses have gardens. A good many of the older houses are unprovided with eave spouting, and in some cases, as at Shute Row, and also at Penpol Terrace, at the back of which the ground rises very sharply, the surface drainage appeared defective, and tending to cause dampness of dwellings. The hovels, known as "the Cots," at the back of Chapel Row, appeared of such slight construction as to be unfit for habitation. They had not been erected as dwelling-houses, one having been built as a shoemaker's shop and the other as an out-building for the working of a lathe. Many back yards are either unpaved or the paving is of so irregular a character that rain water stands about in pools.

Water Supply.—This is in the hands of the Urban District Council from whose mains 232 houses are said to be supplied. The waterworks were begun by the old Local Board in 1868. Householders pay 6d. in the pound on the rateable value of their property, and the water supply is nominally constant. But periods of great scarcity are said to have occurred during the summers of 1896, 1895, and 1887. Even during the driest seasons, however, water was turned on for several hours a day, but during the summer of 1895 other and old sources of supply had to be resorted to. Pressure in the mains is said to average 50 lbs. to the square inch. At my first visit, when the reservoirs were full nearly to the brim, the gauge in the council room showed a pressure of 48 lbs. There is no filtration of the water before delivery.

The water is derived from springs on land belonging to Trethingey and Kayle farms, in the Urban District of Phillack, about two miles from the town of Hayle, to which it flows by gravitation. The gathering ground was entirely pasture land until the present year when, just before my visit, a small portion was ploughed up. The bulk of the water, however, is piped under this field from a more distant point.

In the vicinity of the above-named farms there are four principal springs from which water may be seen rising. The volume at these sources is small, and rapidly dwindles in dry weather.* One spring in particular appeared at my visit to be surrounded by a quagmire, though it was stated that this was not so in drier weather. The gathering ground, which slopes steadily towards Hayle, is intersected by ditches and trenches in various directions, and these cuttings also receive the surface-water running down from the higher ground, though not issuing from any of the four springs just mentioned. Not only are these springs and watercourses freely open to pollution, and evidently polluted by cattle, but here and there in their course they widen into small ponds, or in dry weather become muddy places, to which cattle have free access. It was stated that cattle were accustomed to stand in these ponds in hot weather in the shade of the hedgerows. Not 40 yards distant from one of the springs, and higher up on the sloping ground, are the farm buildings

* Speaking generally, this tract of country appears to abound with little trickling surface springs, though many are said to disappear in dry seasons.



and yard of Kayle Farm. These are only separated from the field in which the spring rises by a rough and descending cart track, on either side of which was flowing one of the numerous streamlets above described. The privy of Kayle Farm is a stone-built lean-to structure at the western extremity of the habitation. There is no cesspit, and the tenant stated that the place was hand-flushed daily. All excrementitious matter flows out or is washed out through an opening in the wall into the farmyard, and then falls into a drain which conveys it down the slope to an unusually large manure heap standing amidst liquid filth in a corner of the yard, and with this it mingles. This manure heap is beside the gate, and immediately adjoins the rough descending cart-track just referred to. Constant trickling of liquid matter from the manure heap has been taking place across the cart track and into the streamlets flowing beside it. The track of the escaping liquid was distinctly marked on the ground, and in the same way it was clearly shown that heavy rain caused overflow on a large scale from this dung-heap across the road down into the little watercourses. As in ordinary weather these watercourses are in communication with the ditches and trenches already referred to, it was clear, as I pointed out to the Medical Officer of Health, that the privy at Kayle Farm was thus directly connected with the water supply of the district.

Below Kayle Farm some of the streamlets have been brought together and descend further by some three principal trenches, of which one, passing beneath the ploughed field above-mentioned, has been piped. At either extremity of this piping, iron tanks have been placed, holding some 200 gallons, to store the water, and also as drinking places for stock. The other streams are open on all sides, and it is difficult to see how they can escape pollution. Under the surface of Trethingey Lane, a rough cart track, which has lately been greatly improved by the filling in of several muddy stock ponds by means of about 300 cartloads of mine burrow refuse, the water is conveyed through stone-ware pipes to an open leat about 2 feet wide. Down this leat it flows for about three-quarters of a mile to two open reservoirs, the last three-eighths of a mile being through 12-inch stone-ware pipes. The joints of the pipes are said to be cemented. The leat, however, is not cemented or even bricked, but is simply an open ditch, though it has been roughly fenced on either side to protect it from the approach of cattle. Nearly the entire course of this open leat is through swampy pasture land, and it must receive the surface water from the sides of the valley through which it passes, as far as the point at which the piping commences. The reservoirs, one of which was constructed in 1868, and the other in 1888-89, hold respectively 1,000,000 and 750,000 gallons. They are surrounded by wooden palisading, which, at the time of my visit, was partly broken down, so that access to the reservoirs could be obtained by anyone desiring it. The inner surface of one of them is of brick, but the other has been rendered in cement. From these reservoirs 5-inch iron pipes convey the water, without any previous filtration, to the centre of the district, and thence by branch pipes to the various houses. Though I was informed that the water had been analysed, I was unable to obtain a copy of such analysis, or to learn by whom it had been made. The statements as to the quality of the water were conflicting. Some ratepayers complained that it was so dirty that to render it fit for drinking it had to be allowed to stand for some time in order that the sediment might settle, while others declared that it frequently contained worms and moving organisms of large size. Others, on the contrary, maintained that the quality was good. The samples drawn for me at various points were pale yellow in colour, and turbid. In the early part of 1894, the occurrence of cases of enteric fever at the hamlet of Praze, in the adjoining rural district of West Penwith, less than half a mile from the springs and leat just described, drew attention to the great danger of the present intake and system of water supply. The Medical Officer of Health and the Inspector of Nuisances admitted to me on the occasion of my visit that a system of filtration was urgently needed. During the scarcity of water which occurred in the latter part of the summer of 1895, a very popular well at Shute Row, in the town of Hayle, which had been previously closed, was re-opened, after an analysis of the water had been made. The result of the analysis is shown in Appendix A. The well is now provided with a pump,

and is used at the discretion of those who prefer it. So far as I could learn, this is the only well in the Hayle district, all others having been closed. The origin of the spring supplying it is unknown, but it probably rises from beneath some adjacent houses. I was unable to ascertain in what manner the well is constructed. During the period of scarcity above referred to, arrangements were made for taking a temporary partial supply of drinking water from the reservoirs attached to Messrs. Harvey's foundry works. The analysis of this water is shown in Appendix B.

Complaints were made to me at Hayle of the fouling of the water by cattle at the spring, and in its course to the District Council's reservoirs. It was also alleged that the water in the reservoirs was polluted by birds. On two occasions I saw seagulls in considerable numbers on the water stored therein.

Sewerage.—The whole of the town of Hayle was sewered as long ago as 1868 by the old Local Board. The gradient of the sewers is stated to be very good. The sewerage commences at the top of Foundry Hill, by a 12-inch pipe (main) sewer, and is continued to Foundry Square, where it is attached to an oval brick sewer 3 feet high by 2 feet wide, and this is continued to the outfall into the harbour, near the gasworks. There is an additional sewer from the east end of the district towards High Lanes, passing down the road at Penpol Buildings and Shute Row, to Foundry Square, where it adjoins the main sewer. Into these sewers all the houses in the principal parts of the district are drained. The main sewer is flushed by a 12-inch pipe from the "Mill Pond," in addition to which, at different points, a 5-inch water main pipe from the reservoirs, having a pressure of 40 to 50 lbs. per square-inch, is connected with stop or sluice valves, and employed for additional flushing twice a week, and oftener if water is sufficiently plentiful. For ventilation, the sewers are connected with two tall chimney stacks at smelting works and iron works respectively. Several ventilating pipes are also carried up trees, and at other points.

The discharge at the outfall into the harbour is continuous. The harbour is tidal, and is connected by means of sluice gates with the waterway known as "Hayle Pool," or the Canal, which is stated to be about 130 acres in extent, and is used for regattas. In this pool, as before stated, water is impounded on the flowing tide, and discharged at the sluice gates at low water, such discharge being intended to prevent the "silting up" of the harbour bar.

House Drainage.—The greater number of houses are provided with water-closets draining to the sewers. Some of the closets are provided with flushing cisterns. Such cesspit privies as exist appeared to me, for the most part, unsatisfactory, either by reason of their dilapidated condition, or their too close proximity to dwellings and footpaths. The worst are in the neighbourhood of Shute Row, and in that part of Hayle on high ground near the new church, where I saw a privy which was used by three families. One very dilapidated privy with leaking cesspit was seen adjoining, though not belonging to, a bakehouse near the railway station. Notice has been served on the owner to abate the nuisance, and to put the premises generally into proper repair.

Excrement Disposal and Removal.—This is carried out by private agency. Where cesspit privies exist each house has generally sufficient garden space in the neighbourhood for the disposal of their contents; and I was informed that where such was not the case there was no difficulty in getting the privies emptied by farmers and gardeners.

Refuse Disposal and Removal.—This is done twice a week by the District Council's agency. Two carts are employed, one being the property of the Council, and the other hired, with the horse, at the rate of 5s. per day. The refuse is taken to a "tip" about half a mile out of the town, on the foreshore of the estuary, beside the Penzance Road. All soft refuse is thence quickly taken away by farmers, and it is stated that at certain seasons there is some competition for it. I saw very little refuse lying about in the district.

Dairies, Bakehouses, &c.—I was informed that there are no common lodging-houses, slaughter-houses, or milk-shops in the district. There are

five nominally registered dairies, which, however, are on a very small scale, only supplying a few families. The greater part of the milk consumed is brought from Phillack. There is only one bakehouse, and its condition was satisfactory, save for the privy already described, though this was situated outside. The large newly fitted biscuit works of Messrs. Hosken, Trevithick and Polkinghorne have been provided with the best sanitary appliances.

B.—SANITARY ADMINISTRATION.

The Hayle Urban Sanitary District was constituted in 1866. The Local Board (now the Urban District Council) consisted of nine members.

The Medical Officer of Health is Mr. Thomas Mudge, L.R.C.P., Lond., and M.R.C.S. Eng., who was appointed in March 1896. He appeared to me to have a thorough knowledge of the district, and to be anxious that all necessary improvements should be carried out. In his first annual report, which has been issued since my inspection of the district, he draws attention to the contamination of the water supply by the sewage of Kayle Farm. He receives a salary of 20*l.* a year, a moiety of which is repaid from county funds, and is in private practice in the district. He is also Medical Officer of Health to the Port Sanitary Authority.

The Inspector of Nuisances is Mr. George H. Eustice. He has held office since March 1893. As Inspector of Nuisances he receives a salary of 20*l.* In addition to this post he holds the offices of surveyor to the Hayle Urban and Phillack Urban Districts. He is also Inspector of Nuisances to the Port Sanitary Authority. He is by profession a practical mining engineer. He holds no sanitary certificate, but he appeared to me a competent and intelligent officer. I saw no written reports by the Inspector of Nuisances, but I was informed that he presented such at the meetings of the District Council. He enters in a pocket book the various nuisances that come under his notice.

The District Council are still unprovided with an isolation hospital for infectious diseases or a disinfecting apparatus. The urgent need of these has again and again been insisted upon by the late Medical Officer of Health, Mr. James Mudge. Negotiations have, from time to time, been carried on between the Hayle and Phillack Local Boards with a view to the construction of an infectious diseases hospital for the joint use of the two districts, and a scheme was drawn up, and a site selected in an excellent position at "High Lanes" in the Phillack district. The then Phillack Local Board contended that the expense should be apportioned equally between the two authorities, while the then Hayle Local Board maintained that the expense should be borne by the respective authorities on the basis of their rateable values. In consequence of this dispute the scheme was suffered to drop.

As recently as the 3rd of June 1896, in reply to an inquiry by the Board as to whether the District Council had under consideration the question of providing an infectious hospital, the Clerk of the Hayle District Council wrote: "I have reason to believe that my Council adhere strongly to the view previously taken by the Hayle Local Board, but I am not in possession of any information as to the present view of the Phillack Urban District Council on the matter."

The District Council have not adopted any of the clauses of the Infectious Disease (Prevention) Act of 1890, or of the Public Health Acts Amendment Act of 1890. They have, however, adopted the Infectious Disease (Notification) Act of 1889, which came into force on October 17th, 1892. I did not see in the possession of the Medical Officer of Health any Register of Notifications of Infectious Diseases. He keeps a volume of certificates which are filled up by the four local practitioners, three of whom are members of the same family and residing in the same house.

Before leaving the district I had the opportunity, at an informal interview with the Chairman of the Hayle Urban District Council, of laying before him the danger to the public water supply under present conditions, and I was assured that the matter would at once be carefully considered, and in all probability, attended to.

The District Council have byelaws allowed by the Home Office on the 4th October 1866, dealing with—

- (a.) Common lodging houses.
- (b.) New streets and buildings.
- (c.) The cleansing of footways and pavements, the removal of refuse, and the cleansing of privies, ashpits, and cesspools.
- (d.) The regulation of slaughter-houses.

But they have not been strictly enforced in all cases, and notably as regards the cleansing of privies and cesspools.

As a result of my inspection, it does not appear possible to accuse the Hayle Urban Sanitary Authority and their successors, the present Urban District Council, of having entirely failed in the discharge of their duties. But there is no doubt that inasmuch as they have not availed themselves of the powers given them by the Public Health Act of 1875 to provide for the isolation of persons suffering from infectious diseases and for the disinfection of bedding, &c., and inasmuch as they have not availed themselves of the powers extended to them by the Infectious Disease (Prevention) Act, and of the Public Health Acts Amendment Act, and also in the due enforcement of their byelaws, it is impossible to avoid the conclusion that they are not sufficiently mindful of their responsibilities of watching over the health of the inhabitants of their district.

Phillack Urban District.

A.—SANITARY CIRCUMSTANCES.

General Description. — The Phillack Urban District is situated in the Registration District of Redruth, and consists of the portion of the parish of Phillack not comprised in Hayle Urban District. It has an area of 2,887 acres. The enumerated population in 1881 was 3,643, and 3,979 in 1891. The inhabited houses numbered 802 in 1881, and 861 in 1891.

The variations in the elevation of the district range from 150 ft. 5 ins. at High Lanes—the highest point—to 17 ft. 6 ins. at Phillack Council Chamber.

The surface soil in the southern and eastern portions of the district consists of loam upon a bed of clay slate, while in the central portion, by Hayle Pool, the soil is chiefly alluvial deposit, and in the northern portion adjoining the sea-shore a bed of blown sand is found. The southern and eastern parts of the district are traversed by lodes of copper and tin. The district is largely rural in character. The largest grouping of population is at Copperhouse, the principal street of which is directly continuous with the main street of Hayle. Copperhouse itself is built along a piece of land sloping to the southern bank of "Hayle Pool," and has the character principally of a workmen's settlement of small one-storied houses. Phillack Church Town, consisting of a few houses only, is situated on the northern side of Hayle Pool. At low water this pool is completely emptied, presenting a large tract of mud. Almost continuous with Copperhouse are clusters of houses rather than villages known as Ventonleague, Trevassick, and High Lanes, and within a quarter to half a mile's distance are others called respectively Guildford and Angarrack. In the direction of the sea is another cluster of about six houses known as Mexico.

Dwelling Accommodation.—Out of the total 860 houses, 460 are rated at less than 5*l.*, and 270 from 5*l.* to 10*l.* The better class houses are built of stone, and others are of brick. The poorer dwellings are built of "copper slag refuse" faced with cement work, and some are built of "cob." There are a considerable number of back-to-back houses built in past years, and even in the rural parts of the district many houses have no other "through" ventilation than that afforded by one small window. The extremities of terraces of small houses in several cases have been so contrived that three separate dwellings are included under one roof. The worst arrangement

of houses on ground was seen in the vicinity of Market Square, in the centre of Copperhouse, such as Prospect Place, Copperhouse Hill, Trevassick Court, Bodriggy Street, and St. John's Street where scarlatina had prevailed. Here there was occasionally much crowding on area, the houses being built irregularly in various directions, and often very close together. Occasionally houses unfit for habitation were met with. In one instance, a species of outhouse at the back of Market Square was being inhabited. The roof was unceiled, the wind penetrating freely through it, and also through crevices in the wall. In the poorer dwellings the flooring consisted, in some instances, of bricks, so much worn and so foul in condition as to be little better than bare ground. Comparatively few houses are provided with eave spouting, and the surface drainage appeared in all cases deficient or defective. Yards are for the most part unpaved, and a good deal of refuse was lying about. In the vicinity of Market Square, where terraces and irregular clusters of small houses have been built upon a steep slope, the ground at the backs of some houses is of so very rough a character as to be absolutely dangerous for walking. At Guildford Lane, in the vicinity of Caroline Row, where two epidemics of enteric fever occurred in 1895, the most dilapidated dwellings were seen, and tenants complained that owing to the rough and undrained condition of the ground surrounding their dwellings, it was necessary to walk through water standing there in order to get in and out of the house after heavy rain. Though at this spot there was a fair amount of garden space, tenants were unable owing to the damp and foul condition of their surroundings to make use of it.

I was unable to hear of any overcrowding of persons.

Water Supply.—With the exception of about 16 houses, some of which are situated in Hayle Terrace, and others in West Terrace, both in proximity to the boundary of Hayle District, which are supplied with water from the Hayle water mains, the supply of drinking water in Phillack Urban District is exclusively from wells. There are said to be eight public wells fitted with pumps, namely, one each at Angarrack, Ventonleague, Phillack Church Town, Market Square, Copperhouse, St. John's Street, Bodriggy Street, Clifton Terrace, and Guildford. I visited all, and found them, without a single exception, to be evidently liable to pollution by soakage from leaking cesspits, ashpits, and by washing into them of refuse upon the ground adjacent. I was unable to ascertain their precise depth, but it apparently varies from 12 to 60 feet, the latter being not exceeded. In those instances in which the sides of the well have been walled at all, they are merely dry steined.

An analysis of the water from one of these wells was made at the cost of one of the principal ratepayers in June 1893, and again in October and November 1895. A copy of the results of this analysis, which was unfavourable, will be found in the Appendix (D). These facts and many others have been and are being constantly brought before the Urban District Council, who have so far successfully resisted all efforts to wake them to a sense of their responsibility in allowing such a state of things to continue. On October 29th, 1895, the Medical Officer of Health of Phillack Urban District reported a serious outbreak of enteric fever at Ventonleague, being the second within 12 months. Dr. Reece visited the district in December 1895, and though he did not in set terms refer the outbreak to any one well in the locality affected, it is nevertheless clear that the water from a polluted well—the one from which inhabitants obtain drinking water under ordinary circumstances—was in all probability answerable for the epidemic.* Subsequently to his visit the well was cleaned out and deepened, and a collar of masonry constructed, but the liability of the water to pollution remains practically the same, as nothing whatever has been done to remedy the defective cesspits and ashpits, or the dangerous conditions of drainage referred to by Dr. Reece as existing at this spot.

In the locality known as Guildford, the public water supply is as follows:—A small spring from which drinking water was obtained, and which was freely polluted by cattle, has been fenced round and in part covered in, while the

* The water was analysed and condemned (see Appendices D. and E.).

water has been piped to an adjacent standpipe. Above and around the spring, house and other refuse of all kinds is thrown, and is undoubtedly washed into it, as well as into an adjoining pump-well from which drinking water can also be obtained, and which is covered in a very inefficient manner. I was informed that in dry seasons there is very little water obtainable from either standpipe or well. The well and spring referred to form, at present, the entire public water supply for the hamlet of Guildford and for that of High Lanes, which is situated at the top of a hill about half a mile distant. The local authority is at present engaged in sinking a well for public use adjoining the high road in the direction of "High Lanes." But I was informed it was considered probable that the work would prove a failure owing to the existence of an old mine adit hard by, which would carry off the water. At present, at the western extremity of "High Lanes," there is a well on private property to which some of the inhabitants are allowed to resort, but those unable to do so must procure water from the above-mentioned public supply at Guildford half a mile distant.

At Clifton Terrace there is only one public pump-well for almost the whole row of houses. I was informed that it is about 30 feet deep, and that the sides are bare earth (clay slate). A sample of the water drawn for me was turbid, and of a yellowish colour. It is said to smell unpleasantly at times, and to be very dirty. A privy, which, until two years ago, had an open bog-hole, stands about 10 feet distant. The bog-hole has been filled up, but the surrounding earth was undoubtedly saturated by filth. About 12 yards from the well are two other privies, having open cesspits, whose sides are bricked but not rendered in cement. Their floors, I was informed, are believed to be bare earth. The pits were quite full of excrement. At Phillack Church Town the public pump-well, which is about 12 feet deep, is sunk in steeply sloping ground, about 40 yards below the churchyard. It also adjoins a kitchen garden, the tenant of which informed me that it was manured with the contents of his cesspit, distant about 16 yards. Adjoining the gate of this garden is a public dipping place, evidently supplying water similar to that contained in the adjacent well, save that here it is directly and freely polluted by refuse and dirt allowed to fall into it. Speaking generally with regard to the public wells for supplying drinking water I did not find one that ought not, in my opinion, to be forthwith closed.

If the public water supply is thus defective, the private wells are in a far worse condition, and very many are obviously so foully polluted that one cannot sufficiently marvel at the obstinacy of those who persist in drawing from such sources the water for their daily consumption. But public feeling on the water question runs very high in Phillack, and a large section of property owners are determined, at all cost, to resist any expenditure of public funds in providing water, since they have already had to incur expense not only in sinking wells but in cleansing, repairing, and maintaining the same. Strong objections are also offered by inhabitants of houses in outlying parts of the district who might have to pay a water rate, without any consequent advantage. Many tenants were anxious to make complaints to me, and a few ventured to do so, but I gathered that they feared by so doing to incur the hostility of their landlords and of some of their neighbours. Near Venton-league a cottager begged me to endeavour to obtain some attention to her case. She was compelled to beg water from neighbours, the well attached to her cottage being in a filthy condition. The water was stinking, and she stated that "dead eels" had been taken out of it; she had been complaining unavailingly for months past. Ten yards distant from the well in question was a rotting wooden privy, with a large and full open bog-hole. For generally unwholesome conditions of every kind this cottage, and others in its vicinity, exceeded anything I witnessed in the district, and should at once receive attention.

In Copperhouse itself I was informed that the inhabitants on the north side of the main street favoured the proposed public water supply scheme. They have no private supply, as the close proximity of their houses and back yards to the foreshore of Hayle Pool rendered it impossible to obtain anything but brackish water from wells on this side of the street. A

prominent and respected ratepayer resident at this spot informed me that for a supply of drinking water he depended upon the kindness of a neighbour opposite; the carriage of this water alone cost him from 2*l.* to 3*l.* per annum. In my opinion all the wells should be condemned along the main street, consecutive blocks of which are known as Fore Street, Commercial Road, and Hayle Terrace. Every well which I saw here was almost certainly liable to soakage of foul liquids, which, in many cases, was seen going on actively. Along the south side of the thoroughfare, drinking water is procured from dip or pump wells a few yards from the backdoors of the houses, and situated at the foot of steep slopes, upon the top of which stand privies, with cesspits freely leaking, or without any cesspits at all, as well as refuse heaps and chicken-houses upon an extensive scale. Foul moisture from these places reaches the wells not only by soakage but also by directly flowing into them over the surface of the ground.

Further along the same road in the direction of Hayle, I was informed that the wells are affected by any unusually high tides, after which the water is salt to the taste. Diarrhœa appears to be caused by drinking the water of some of these wells. Some of the wells are so large in diameter that they pass beneath the party walls of houses, and serve simultaneously for the supply of two families. Thus, at one house, I found a well the water from which had been condemned, after analysis, by order of the District Council. But though condemned in one house it could be used in another, as the well was large, and passed beneath the party wall. In several instances the water from wells has been pronounced unfit for drinking, but is, nevertheless, still in regular use.

In addition to these sources of drinking water there are 12 or 14 public standpipes to which water is laid on from the Ventonleague millpond or reservoir. This is a roughly puddled pond which was originally intended for use in connexion with the foundry works. These standpipes bear, or should bear, the inscription, "Caution.—This water is not to be used for drinking." The water is intended only for household purposes, as it is very impure. But two of the standpipes which I visited bore no inscription whatever, and, from what I saw and heard, I believe the water obtained from these standpipes is at times used for drinking, especially by children.

A supply of wholesome drinking water for the district is urgently needed, and the question of furnishing such supply has, on divers occasions, been considered. The subject will be further dealt with under the heading of Sanitary Administration.

Sewerage and Drainage.—Copperhouse contains the only sewers in Phillack district. These date from 1883. Twelve-inch glazed pipes are laid from a point near the gasworks, and opposite the reservoir or "Mill Pond," down the main street, with a gradient of 1 in 650, as far as Market Street. From that point it passes, as a 15-inch pipe sewer, with a gradient of 1 in 650, as far as Chapel Row, where it becomes an 18-inch pipe sewer, which, with a gradient of 1 in 800, conveys the sewage to the outfall in Hayle Harbour, close to the swing bridge. Into this sewer, branch sewers (consisting of 12-inch and 15-inch pipes) from the side streets are conducted at good gradients. Manholes are placed at the points of junction. House drains convey, for the most part, slop water only. The system of sewers is flushed from the mill pond, with which it is connected by a sluice valve. When this pond runs dry, as it does in hot weather, the sewers are not flushed at all. Other small centres of population, such as Phillack Church Town, Clifton Terrace, and Angarrack, have no sewerage or drainage whatever. Plans have been drawn for the sewerage of Ventonleague, including Caroline Row, where the outbreak of enteric fever occurred in 1895, and also for Guildford Lanes, already referred to. After the late epidemic of enteric fever, some disposition was shown by the District Council to carry out this work of sewerage of Ventonleague, but it fell through. I was informed that the sewer in Bodriggy Street, the highest point in Copperhouse, is in regular use, but that it has never been flushed since it was laid. There are great complaints of foul smells in the vicinity. As there are very few water-closets in Copperhouse, the sewers contain little but liquid drainage. Many of the houses have no slop drain at all, even in parts of Copperhouse or its

immediate vicinity. In other cases a single yard drain with gully serves for a group of dwellings. At Clifton Terrace a large portion of slop and refuse water undoubtedly had been flowing across the road and over the edge of the cliff upon the northern foreshore of the waterway below. This was in some instances denied, but the evidences of it were unmistakable. Some system of drainage is urgently needed at Ventonleague, Guildford Lanes, and Angarrack.

Excrement and Refuse Disposal.—Privies are in general use. In most instances they are provided with cesspits; though in many cases coming under my notice, excrement appeared to fall upon the ground beneath the privy or into a mere depression of the soil. The cesspits are often of excessive size, and sunk below the ground level. Many were quite uncovered; others had covers that were loose or imperfect. Dangerous examples of the latter were seen, as, for instance, at the Wesleyan Schools, Copperhouse, where children are constantly playing on the wooden flap covers of the cesspits, which stand in the school playground. The cesspits in question appeared also to be used as ashpits.

The wooden "sentry-box" seems a common and favourite type of privy. At Cross Street, in a central part of Copperhouse, I saw a wooden sentry-box privy for the use of two families. The structure is falling over on its back, and now inclines backward at such an angle that its use must be difficult. The cesspit has been filled in, and excrement now lies where it falls on the ground, into which it soaks. A well, used by several families, is a few yards distant. At Angarrack a row of five wooden privies were seen in a ruinous condition, the floors rotten and crumbling, and the roofs in process of collapsing. The place was quite uncared for. I saw no cesspit, but there was a species of shallow trench in the ground beneath. Excrement had collected here until it appeared above the seats in some of the privies. From immediately beneath these privies was issuing a stream of water, which flowed thence into the little river, distant only a few feet.

Public scavenging, I was informed, is carried out by the Urban District Council. It appears that that body expends the sum of 2s. 6d. per week in the hire of a horse and cart for one half day, which is considered sufficient for the removal of house refuse. A piece of ground on a wharf beside Hayle Pool, a few yards distant from the Market House, where the Urban Council's meetings take place, has been rented by them from Messrs. Harvey and Co. It is fenced round with a species of wooden palisade, to prevent access; this ground is used as a "tip" for the cart in question. It was admitted that cesspit contents mixed with sand have been not unfrequently deposited there. There has been a large accumulation of refuse at this spot during 12 months, and just previously to my visit it had been disposed of by the District Council to farmers at the rate of from 6d. to 8d. a cartload. East and north-east winds, which prevail hereabouts during the winter and spring, could not fail to carry foul dust from this "dumping place" into Copperhouse.

Before leaving this subject it may be mentioned that nearly opposite to Hayle Terrace, and at the other end of the main street of Copperhouse, a piece of the foreshore adjoining the high road and close to the houses is being filled up and levelled by "tipping" there cartloads of refuse, among which I detected house-refuse and vegetable matter.

Slaughter-houses.—There are said to be five slaughter-houses in the Phillack Urban District. Three out of the four that I inspected were the property of members of the District Council. In one of them the fasting house was only partially screened from the slaughter-house. Another was in a very small confined yard surrounded closely by houses. There is a small open dip well immediately adjoining this slaughter-house, and also a roughly constructed privy, the excrement from which flows into an open pit stated to be emptied once a week. It is evident that as there is no drain, blood and filth flow away into the roughly paved yard. In the yard is a gulley draining to the sewer. In another slaughter-house, situated beyond the town, there was a pile of manure 20 feet by 16 feet, and averaging 2 feet 6 inches high, covered with sand. Blood and offal were evidently buried in this heap, and blood was lying about. At another spot a heap of manure containing blood and offal was standing close to a slaughter-house, and the whole was freely

draining into an adjacent running stream. These places are undoubtedly inspected, but the bye-laws concerning them are not enforced.

Cowsheds, Dairies, and Milkshops.—These are registered, but there are no regulations in force concerning them. There are, it is said, five milkshops; those seen were not particularly clean, but their trade is small. A small dairy and milkshop at Gleve Row, Phillack Church Town, was particularly dirty and ill kept. The utensils are washed with water from an adjacent well, into which liquid was observed to be dribbling from the adjacent ground, upon which were heaps of filth of all kinds. Curwin Farm is a large dairy farm where are some 40 cows. At the door of the cowhouse there stood at the time of my visit a manure heap measuring some 46 feet by 30 feet, and about 4 feet high in parts. Liquid manure was streaming from it in all directions and stood around in pools. The tenant assured me that water for cleansing the milk utensils was brought from a stream at a little distance. Nevertheless, I noted that there was a filthy horse pond, as also a well, beside the cowhouse, and that means existed for pumping water to the cowhouse boiler indifferently from the well and from the pond. Into the well could be seen percolating in a stream water undoubtedly contaminated by foul matters in the farmyard. The water from this well is admittedly used by the labourers and dairymen for drinking, but it was stoutly denied that the same is used for washing the milk vessels. However this may be, a pipe from the engine boiler fed, as I have said, from the well or from the horsepond, passes into the milk-shed, and is provided with a tap and sink therein. I ascertained too, that there was water in the pipe, and noted that the sink was wet from recent use.

B.—SANITARY ADMINISTRATION.

The Phillack Urban District was constituted in the year 1866.

The Medical Officer of Health is Mr. Zachary Belling Mudge, M.R.C.S., and L.R.C.P., London, who was appointed in August 1895. He receives an annual salary of 30*l.*, half of which is repayable from public funds. He has lived in this neighbourhood all his life, residing with his father, who was formerly Medical Officer of Health to this same district, and did excellent sanitary service in it. Mr. Mudge is well acquainted with the district, and appeared to me to be keenly alive to the need for improvements.

The Inspector of Nuisances is Mr. William Caddy, who receives an annual salary of 10*l.* He has no pretension to any sanitary training or knowledge whatever. He holds the additional posts of assistant overseer, rate collector, and school attendance officer. I saw no reports annual or other from Mr. Caddy.

The District Council are not provided with an isolation hospital for infectious diseases or a disinfecting apparatus. These wants have been urged upon them year by year by their medical officers of health. They have not adopted the Infectious Disease (Notification) Act, 1889, nor any of the clauses either of the Infectious Disease (Prevention) Act, 1890, or of the Public Health Acts Amendment Act, 1890. They have a code of bye-laws, being those of the old Phillack district, and dated 1870, dealing with—

- (a.) Common lodging-houses.
- (b.) New streets and buildings.
- (c.) The cleansing of footways and pavements, the removal of refuse, and the cleansing of earth closets, privies, ash-pits, and cesspools.
- (d.) The prevention of nuisances arising from snow, filth, dust, ashes, and rubbish, and the keeping of animals.
- (e.) Slaughter-houses.

In view of the importance of the question of water supply for Phillack, it may be well to give a somewhat detailed resumé of the correspondence that has occurred between the Board and the Phillack Sanitary Authority on this subject, as well as of such action as has so far been taken.

In March 1888, the Board received from the Local Board of the District of Phillack an application to borrow under the Public Health Act of 1875

the sum of 1,000*l.* to defray the cost of bringing into the district a supply of water "for flushing the sewers and for domestic purposes." A copy of an analysis of the water which it was proposed to lay on, together with detailed estimates of the works, were received by the Board from the local authority. On the 20th of April 1888, the Board directed that plans and sections of the proposed work should be submitted to them. Accordingly, on the 12th of May, the clerk to the Phillack Local Board wrote that these were being forwarded "under separate cover." They were not received by the Board, and, after much correspondence, the clerk, in a letter dated the 15th December 1888, stated that the surveyor to the Phillack Local Board had been instructed to prepare duplicate plans, and to forward them to the Board with as little delay as possible. These plans not being forthcoming, the Board wrote to the Phillack Local Board on the 24th January 1889, and again on 16th April 1889, to inquire when these plans might be expected to arrive. In response to a third letter of similar inquiry, dated the 27th May 1889, the clerk wrote under date 1st June 1889, that the Board's previous letter had been duly received, but that a resolution had been passed by the Phillack Local Board "that it lie on the table for six months." He added, "Your present letter shall be put before the Board at their next meeting to be held on the 11th instant." Nothing further being heard of the matter, the Board, on the 17th February 1890, again inquired what steps the Phillack Local Board proposed to take in regard to water supply, and were in reply informed, on the 15th March following, that at a meeting of that body a resolution had been carried "that the majority of the members of the local board do not consider that the district requires the water to be brought in." Matters thus dragged on until the 7th March 1892, when the Board again wrote with reference to the annual report of the Medical Officer of Health, Mr. James Mudge, who had pointed out the danger of the wells in Phillack district, and inquired what action the local authority proposed to take. In reply they were informed that the Phillack Local Board considered the existing supply sufficient. The Board, in their rejoinder, dated the 5th May 1892, pointed out that the local board were incurring a serious responsibility if they did not take steps to provide a better water supply for the district. On the 19th November 1892, a complaint under section 299 of the Public Health Act of 1875, was received from the County Council of Cornwall that the Phillack Local Board had made default in respect of sewerage and water supply of their district. Considerable correspondence with the Phillack Local Board and the County Council was subsequently carried on, and a public meeting of the ratepayers of Phillack district was held on the 28th August 1893, at which it was resolved to adhere to the existing system of supply. A public inquiry was subsequently held on the 19th January 1894, by Mr. Codrington, one of the Board's Engineering Inspectors, to determine whether the Phillack Local Board had made default in the matters complained of by the County Council. The evidence was defective in respect of the filter beds that would be necessary for the proposed sources of supply, and also in respect of the consent of, and compensation to, mill owners and riparian proprietors. Being pressed by further letters from the Board, inquiring as to the steps they proposed to take in regard to the water supply of the district, the Phillack Local Board on the 18th August 1894 replied that owing—(1) To the contemplated closing of the engineering works of Messrs. Harvey, which would seriously affect the rates; and (2) the proposed amalgamation of Phillack district with the adjoining one of Hayle, which was under consideration, they did not see their way to take any steps in the matter of water supply, and they begged that the Board would not, under these circumstances, press the matter further. The Annual Report for 1894 of the Medical Officer of Health for Phillack, dated 12th February 1895, drew attention once more, in strong terms, to the urgent wants of the district. A few days later he announced an outbreak of enteric-fever in a portion of the district known as Ventonleague, and that 17 cases had occurred, with 4 deaths. On the 3rd August 1895, Mr. Z. Belling Mudge succeeded to the office of Medical Officer of Health, on the retirement of Mr. Cleaver. On the 29th October he reported a serious epidemic of enteric fever, recurring in the same locality as the outbreak in February. Under instructions from the Board,

Dr. Reece, as already recorded, visited the place on the 2nd December 1895, and reported that the outbreak was associated with the pollution of wells by sewage. In this re-appearance of enteric fever 32 cases occurred, with 5 deaths. In response to an urgent letter, dated 31st December 1895, pointing out the grave responsibility the Urban District Council would incur if they "delayed action with a view to the provision of a satisfactory and wholesome supply of water for the whole of their district," the Clerk to the Local Authority replied that his Council "had resolved to sink an additional well that the majority of the inhabitants were well satisfied with the quality and quantity of the existing water supply, and that the Council were not aware of any power to enforce on the great majority of the inhabitants of the district that which they did not require." On the 6th February 1896, the Board pointed out to the Phillack Urban District Council the futility of sinking more wells in sewage-polluted soil, and cast upon them the responsibility for their neglect.

The threatened closing of the engineering works of Messrs. Harvey, referred to by the Urban District Council, has not yet taken place. The firm still employ, I was informed, from 450 to 500 workmen. The extra hands who were employed in connexion with certain experimental ship building works, resided outside the Phillack and Hayle districts. The diminution in the number of men employed at these works is probably quite compensated for by the employment of some 300 persons by the National Explosives Company. Messrs. Hoskins, Trevithick, and Polkinghorne also employ some 285 persons in their new milling and biscuit works. The proprietors of the Mellanear Tin Smelting Works have also erected, and have in course of erection, arsenic and zinc extraction works. The District Surveyor informed me that he considers that the districts of Hayle and Phillack are at present in almost as good a financial position as they have ever enjoyed. He believes that in neither is there at present an unoccupied house, and more houses have been built in the past 10 years than in the previous 20 years. But however this may be, there can be no question that the need for a proper supply of wholesome drinking water for Phillack is an urgent one. Phillack should therefore at once set about providing such supply, or should combine with Hayle for this purpose.

As to a separate scheme for Phillack, the evidence of Mr. Jenkins, Surveyor to the County Council of Cornwall, at the inquiry above referred to, went to show that the only reliable supply was to be obtained from a stream known as Nanspuska, which issues from an adit of a disused mine* known as the old Herland Mine, about two miles from Copperhouse. The mine in question has not been worked, I am informed, for 50 years. In the Appendix (F.) will be found the result of the analysis of this water. It was stated at the inquiry that the water issues from the ground heavily charged with ochre, and that the sample analysed and pronounced "an excellent sample of water for drinking," was taken at some little distance from the source, and after the stream had passed through a bed of weeds. I inspected the stream at the point where it rises. It appeared slightly turbid, and of a very pale yellow colour, but the weather for some time previous to my visit had been continuously wet. At a short distance below its source, the stream passes through a very thick bed of weed, which would undoubtedly act as a rough natural filter. I was informed by the Surveyor to the Phillack Urban District Council that in the "driest" months of 1893 he had gauged the flow of this water, and found that it was never less than 240,000 gallons in 24 hours, being at the rate of 60 gallons per head of the population of the district. The Surveyor stated that the whole of the district could be supplied by gravitation, with the exception of 50 houses, chiefly at "High Lanes." As the whole of the water that could be supplied at the town levels would not be required for domestic purposes, it was proposed that the balance should work a turbine, to force water to a reservoir to be constructed at the highest part of "High Lanes," and from this the roofs of the highest houses could be reached.

* This point, Mr. Eustice, the surveyor, informs me, is 43·2 above ordnance datum.

The water thus employed for working the turbine could subsequently be used to flush the sewers. The Surveyor has calculated that the increased rate necessitated by the expenditure upon this work (estimated at 4,000*l.*) would be equal to about $\frac{3}{4}$ *d.* or less than 1*d.* per week for ratepayers living in houses rented at less than 6*l.* per annum. This calculation is based upon an assumed charge for water of 6*d.* in the £ upon the rateable value of houses, as is the case in the adjoining district of Hayle. Upon the whole, however, I am disposed to consider that amalgamation of Phillack and Hayle for the purposes of water supply would best serve the interests of both places. At the present time Hayle is in doubt as to its powers with regard to safeguarding its sources of water supply, which are situated in the Phillack district. Moreover, the amount of water at the disposal of Hayle is insufficient for its own purposes. In dry seasons—as, for instance, the summer of 1896—a water famine in the town might easily ensue. In any case, therefore, Hayle will require a better and more extensive supply; and if this is to be obtained, as before, in the Phillack district, there would be distinct advantage from joint action of the authorities in obtaining a satisfactory supply common for both districts.

F. ST. GEORGE MIVART.

APPENDIX A.

REPORT of ANALYSIS of WATER at SHUTE ROW.

To Mr. Eustice, Hayle.

I, the undersigned, being a Public Analyst, do hereby certify that I received on the 2nd day of September 1895, from you a sample of water for analysis, and have analysed the same, and declare the result to be as follows:—

Hardness :			Parts in 100,000.
Total solids dried at 100° C.	-	-	50·5
„ ignited	-	-	—
Chlorine	-	-	7·2
Nitrogen, present as nitrate	-	-	·56
Ammonia	-	-	None.
Albumenoid ammonia	-	-	·005
Oxygen consumed from permanganate of potash in 4 hours	-	-	·05

This water is similar to that of sample No. 1, but distinctly of better quality.

In my opinion it may be used for drinking.

As witness my hand this 4th September 1895.

JOHN J. BERINGER, F.I.C., F.C.S.

The Laboratory, Camborne.

APPENDIX B.

(Messrs. Harvey & Co.'s reservoirs used last summer for a short time in an emergency.)

Same form as preceding.

Hardness :	Parts in 100,000.
Total solids dried at 100° C. - - - -	82·0
„ ignited - - - -	—
Chlorine - - - -	9·6
Nitrogen as nitrate - - - -	·42
Ammonia - - - -	·002
Albumenoid ammonia - - - -	·007
Oxygen consumed from permanganate of potash in 4 hours - - - -	·07

This water contains over much solids, especially common salt, for a good water. The organic matter present is moderate; so, too, are the nitrates and ammonia, the evidence of decomposed impurity. I should have no hesitation in using it on an emergency, but it is not a desirable water.

JOHN J. BERINGER.

4th September, 1895.

APPENDIX C.

Analysis of Phillack waters taken from St. John Street and Market Street Pump analysed by Thos. P. Blunt, Public Analyst for Shropshire, Herefordshire, Montgomeryshire, and Merionethshire.

June 3, 1893, two waters sent A. and B.

General properties - - - -	Both quite clear.
Colour - - - -	None.
Odour - - - -	None.

Result of analysis expressed as—	Grains per gallon.
Solids in solution dried at 140° C. - - - -	71· 60·
Saline ammonia - - - -	·003 ·004
Albumenoid ammonia - - - -	·005 ·007

Nitrogen as nitrates - - - -	<div style="border-left: 1px solid black; border-right: 1px solid black; padding: 0 10px;"> Excessive; more than 4 grains in each case. </div>
Chlorine as chloride - - - -	
Poisonous metals - - - -	None.

Remarks.—Both these waters are well filtered and free from recent sewage, each of them contains, however, large quantities of sewage residues, showing that it passes through polluted strata. The waters are very much alike in character. They cannot be recommended as safe drinking waters, as their present fairly pure condition may at any time be lost, and they may become dangerously contaminated.

THOS. P. BLUNT, M.A., F.C.S., &c.

(Water from well at Clifton Terrace, Phillack.)

To Mr. G. H. Eustice, Hayle,

I, the undersigned, being a public analyst, do hereby certify that I received on 22nd day of May 1890 from you, per Clemo, a sample of water for analysis, and having analysed the same, declare result as follows:—

	Parts in 100,000.
Hardness, 31·0.	
Total solids dried at 100° C. - - -	44·0
„ „ ignited - - -	42·0
Chlorine - - -	4·6
Nitrogen present as nitrate - - -	·83
Ammonia - - -	·002
Albumenoid ammonia - - -	·006
Oxygen consumed from permanganate of potash in 4 hours - - -	·02

It yielded a fairly abundant brown sediment; although the water contains only a moderate amount of organic matter, it is only of second rate quality. It contains an excess of nitrates and earthy salts, and although fairly well filtered, is probably dirty in its origin.

As witness my hand this 3rd June 1890.

J. J. BERINGER, F.I.C., F.C.S.

The Laboratory, Camborne.

APPENDIX D.

Analysis of water in the pump to the west of Caroline Row, October 15, 1895.

General Properties	-	Clear, but for a few floating particles.
Colour	-	None.
Odour	-	None.

	Grains per Gallon.
Solids in solution dried at 140° C. - - -	49·
Oxygen absorbed in 4 hours at 15° C. - - -	·014
Nitrogen in nitrates - - -	1·6
Chlorine in Chlorides - - -	7·7
Poisonous metals - - -	None.

(Signed) T. P. BLUNT, Public Analyst, &c.

Remarks.—Dear Sir, I have completed my analysis of the water received on the 15th inst., and give the results on the fly leaf; they are not satisfactory. The water, it is true, is well filtered, and nearly free from recent organic matter, but the other data are all high, and indicate an impure source for the spring. Under such circumstances the water cannot be regarded as safe for drinking purposes.—I am, dear Sir, yours, &c., T. P. BLUNT.

APPENDIX E.

Analysis of water taken from a pump about 80 yards to the east of
Caroline Row, November 7, 1895.

Physical characters :—

Suspended matter	-	-	-	Moderate amount.
Appearance in a column 2 feet long	-	-	-	Slightly yellow and turbid.
Taste	-	-	-	Normal.
Odour	-	-	-	None.

On analysis, water gave the following result :

	Grains per Gallon.		Grains per Gallon.
Total solid matter	-	50·12, which lost on ignition	- 6·44.
Chlorine	-	6·55, equal to sodium chloride	10·80.
Nitrogen in oxidized forms	1·54, equal to nitric acid	-	5·94.
Poisonous metals	-	-	None.
Degree of hardness,	28.		
			Parts per million.
Reducing power representing the oxygen absorbed	-	-	·37
Free and ureal ammonia	-	-	·04
Albumenoid ammonia	-	-	·12

Remarks.—These results prove the water to have suffered excessive pollution by cesspool drainage or analogous impurity. The polluting matter has subsequently undergone tolerably perfect destruction by oxidation, so that in its present condition the water is fairly free from readily changeable organic matters, but such a water must always be regarded with grave suspicion, as changeable weather or other conditions might interfere with the process of spontaneous purification. The water cannot be regarded as suitable or even safe for drinking.

ALF. H. ALLEN, F.I.C., F.C.S.
Public Analyst for the West Riding of Yorkshire,
City of Sheffield, &c.

APPENDIX F.

Assay Office and Chemical Laboratory,
30 & 31, St. Swithin's Lane, London, E.C.,
7th October 1893.

GENTLEMEN,

I BEG to state that I have analysed the sample of water received on the 2nd instant, and find that it contains as under, viz. :—

Chlorine	-	-	-	-	2·86 grains per gallon.
Nitrogen (in nitrates, &c.)	-	-	-	-	a trace.
Ammonia, free	-	-	-	-	·0032 grains per gallon.
Oxygen absorbed in four hours	-	-	-	-	·015 " "
Ammonia albumenoid	-	-	-	-	·0032 " "
Total solid matters	-	-	-	-	19 " "
Hardness	-	-	-	-	9 $\frac{3}{4}$ degrees.

It was also found to be free from the poisonous metals.

I consider this an excellent sample of water for drinking and all other domestic purposes.

To Messrs. S. W. Jenkin and Son. (Signed) BENEDICT KITTO,
Public Analyst.

